

## **Fingerprints & Cartridge Cases: How Often are Fingerprints Found on Handled Cartridge Cases and Can These Fingerprints Be**

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### **Introduction**

This study was designed to ascertain the likelihood of: (1) obtaining fingerprints on fired and unfired cartridge cases and (2) obtaining DNA typing results from any of the cartridge cases processed for fingerprints. A total of 48 cartridge cases were used in this study. The cartridge cases were made of brass, nickel-plated brass, and aluminum. They ranged in caliber from 22 to 45 (5.6mm – 11.4 mm). Three types of fingerprints were placed on these cartridges: bloody fingerprints, eccrine/sweat prints and oily prints. Half of these cartridges were fired after receiving the fingerprint impressions. The fired and unfired cartridges were stored for several months at room temperature and then processed for fingerprints. The bloody fingerprints were developed with amido black while the eccrine and oily prints were processed by cyanoacrylate fuming followed by rhodamine 6G dye and illumination with laser light. After the cartridges/cases were processed for fingerprints, DNA was collected from the cartridges/cases with dampened swabs. The samples on the swabs were then extracted for DNA and amplified with Applied Biosystem's Profiler Plus STR reagent kit.

### **Experimental Data: Fingerprints on Fired and Unfired Cartridges**

The tables, on the next 2 pages, outlines the information obtained from a visual examination of the fingerprints placed upon cartridges that were and were not fired. The table is organized according to whether the cartridges were fired and also according to the type of fingerprint placed on the cartridge: bloody fingerprint, eccrine/sweat fingerprint or oily fingerprint.

The bloody prints on all eight, unfired cartridges were visible without processing. It is interesting that the two useable or identifiable prints were found on aluminum cartridge cases (.45 caliber and 9mmP). The poor quality prints on the nickel and brass cartridges might be explained by what appeared to be a "hydrophobic" surface treatment of these metal surfaces that caused the liquid blood to be repelled when it was placed down. In contrast to the unfired cartridges, only 3/8 of the bloody prints on the cartridges were recognizable after the cartridges had been fired and only one of those prints was useable or identifiable.



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None of the eccrine/sweat prints on the next 16 brass, nickel and aluminum cartridges were visible before processing. After processing, **no** useable or identifiable prints were developed.

The last set of prints examined were oily prints on 16 fired and unfired cartridges. Only three prints were classified as usable or identifiable after fingerprint processing and these prints were found only on cartridges that had **not** been fired.



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**Data from Unfired Cartridges**

Unfired Cartridge #	Type CC	Metal type	Bloody print/visible prior to processing?	Bloody print/visible after processing?	Print Classification Before Processing	Print Classification After Processing
1	22LR	brass	Yes	Yes	No Value	No Value
2	22LR	nickel	Yes	Yes	No Value	No Value
3	45ACP	aluminum	Yes	Yes	Identifiable	Identifiable
4	45ACP	brass	Yes	Yes	No Value	No Value
5	45ACP	nickel	Yes	Yes	No Value	No Value
6	9mmP	aluminum	Yes	Yes	Useable	Useable
7	9mmP	brass	Yes	Yes	No Value	No Value
8	9mmP	nickel reload	Yes	Yes	No Value	No Value

Unfired Cartridge #			Eccrine print/Visible prior to processing?	Eccrine print/Visible after processing?	Print Classification Before Processing	Print Classification After Processing
9	22LR	brass	No	No	No Print	
10	22LR	nickel	No	No	No Print	
11	45ACP	aluminum	No	No	No Print	
12	45ACP	brass	No	Yes		No Value
13	45ACP	nickel	No	No	No Print	
14	9mmP	aluminum	No	Yes		No Value
15	9mmP	brass	No	No	No Print	
16	9mmP	nickel reload	No	No	No Print	

Unfired Cartridge #			Oil print/Visible prior to processing?	Oil print/Visible after processing?	Print Classification Before Processing	Print Classification After Processing
17	22LR	brass	No	Yes		No Value
18	22LR	nickel	Yes	Yes	No Value	No Value
19	45ACP	aluminum	No	Yes		No Value
20	45ACP	brass	Yes	Yes	Identifiable	Identifiable
21	45ACP	nickel	Yes	Yes	Useable	Useable
22	9mmP	aluminum	No	Yes		No Value
23	9mmP	brass	Yes	Yes	No Value	No Value
24	9mmP	nickel reload	Yes	Yes	No Value	Identifiable



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**Data from Fired Cartridge Cases**

<b>Fired Cartridge #</b>	<b>Type CC</b>	<b>Metal type</b>	<b>Bloody print/visible prior to processing?</b>	<b>Bloody print/visible after processing?</b>	<b>Print Classification Before Processing</b>	<b>Print Classification After Processing</b>
1F	22LR	brass	No	No	No Print	No Print
2F	22LR	nickel	No	No	No Print	No Print
3F	45ACP	aluminum	Yes	Yes	No Value	No Value
4F	45ACP	brass	Yes	Yes	Useable	Useable
5F	45ACP	nickel	No	No	No Print	No Print
6F	9mmP	aluminum	No	Yes	No Print	No Value
7F	9mmP	brass	Yes	Yes	No Value	No Value
8F	9mmP	nickel reload	No	No	No Print	No Print

<b>Fired Cartridge #</b>			<b>Ecchine print/Visible prior to processing?</b>	<b>Ecchine print/Visible after processing?</b>	<b>Print Classification Before Processing</b>	<b>Print Classification After Processing</b>
9F	22LR	brass	No	No	No Print	No Print
10F	22LR	nickel	No	No	No Print	No Print
11F	45ACP	aluminum	No	No	No Print	No Print
12F	45ACP	brass	No	No	No Print	No Print
13F	45ACP	nickel	No	No	No Print	No Print
14F	9mmP	aluminum	No	No	No Print	No Print
15F	9mmP	brass	No	No	No Print	No Print
16F	9mmP	nickel reload	No	No	No Print	No Print

<b>Fired Cartridge #</b>			<b>Oil print/Visible prior to processing?</b>	<b>Oil print/Visible after processing?</b>	<b>Print Classification Before Processing</b>	<b>Print Classification After Processing</b>
17F	22LR	brass	No	No	No Print	No Print
18F	22LR	nickel	No	No	No Print	No Print
19F	45ACP	aluminum	No	No	No Print	No Print
20F	45ACP	brass	No	No	No Print	No Print
21F	45ACP	nickel	No	No	No Print	No Print
22F	9mmP	aluminum	No	No	No Print	No Print
23F	9mmP	brass	No	No	No Print	No Print
24F	9mmP	nickel reload	No	No	No Print	No Print



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### **Conclusions from Fingerprint Data**

The prints made for this study do not necessarily reflect what would be encountered on evidence cartridge cases. One reason these prints are different than evidence submissions is that bloody fingerprints are rarely seen on either fired cartridges cases or unfired cartridges submitted as evidence. Also, there was a deliberate attempt to impress fingerprints on the test cartridges for this study and this factor would not be too likely to operate in an actual case. Thus, these results are likely to represent the best-case scenario with respect to evidence cartridges and cartridge cases.

No usable prints were observed on any of the twelve smaller (22LR) cartridges cases (N=12) regardless of the type of fingerprint or fingerprint processing method used. In contrast, 6 useable prints were developed on the 9mmP and 45ACP cartridges (N=36). It is not too surprising that the chances of getting an identifiable or usable print are increased if the surface area available for the print is greater.

If the eccrine/sweat prints are considered separately, no useable prints were developed on **any** of the cartridges (N=16) with this type of print. This finding may have been impacted by the long time frame between the time the prints were deposited and the time the cartridges were processed (more than 6 months).

Finally, only 3 oily prints were classified as identifiable/usable and these 3 prints were found on the **unfired cartridges (N=8)**. No useable, oily prints were found on any of the fired cartridge cases (N=8). Similar to the bloody prints, there was a greater likelihood of getting useable/identifiable prints on the unfired cartridges.

Overall, only 6 prints were classified as useable or identifiable on the 48 cartridges/cases examined. Only **1 of 24 fired cartridges** had prints that were classified as usable or identifiable compared to **5 of 24 unfired cartridges** having a usable or identifiable prints. Thus, the chance of obtaining a usable or identifiable print is greatly reduced if the cartridge is fired. Further, if the bloody prints are eliminated from this analysis, only 3 of 32 cartridges/cases displayed useable fingerprints and these were only found on unfired cartridges.

### **Data and Conclusions: DNA Profiles Recovered from Cartridges/Cases**

After the cartridges/cases were processed for fingerprints, DNA was collected using moistened swabs. The samples on the swabs were organically extracted with phenol-chloroform. Since most of the samples were not expected to yield very much DNA, the resulting DNA extracts were amplified with Applied Biosystem's Profiler Plus STR reagent kit. Only 3 DNA profiles were obtained from the 48 cartridges/cases that were tested. All 3 of these profiles were obtained from bloody prints: 2 profiles from cartridges that had not been fired and 1 profile from a cartridge case that had been fired. The profile obtained from the fired cartridge case showed typing information at 9 out of 10 loci [typing information was only missing at the D7 locus]. A higher success



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rate for obtaining DNA profiles might have been obtained if the cartridges/cases were not first processed for fingerprints.

Bloody prints are not frequently encountered on cartridge cases. If the bloody prints are eliminated from consideration, no DNA profiles were obtained on 32 cartridge/cases examined in this study. The failure to obtain DNA results on these cartridges/cases can likely be attributed to the small amount of DNA left behind on smooth metal surfaces and the use of fingerprint processing techniques that can significantly reduce the amount of DNA available for analysis.